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PCT/EP2004/052781 Annex to the IPER

From European Patent Disclosure EP 0 917 856, International Patent Disclosure WO 95/13017, and US Patent 6,428,206, X-ray machines with C-arches are known. In each case, a patient-supporting device is also disclosed, under which the respective C-arch is supported. In each C-arch, both an X-ray emitter and the associated X-ray detector are supported. Therefore each C-arch encompasses an arc angle of at least 180°, so that the emitter and detector can be positioned diametrically opposite one another. The axis to the respective patient-supporting device is restricted by a C-arch of that size.

The object of the invention is to disclose a patient-supporting device with a positioning device for an X-ray detector which simultaneously assures as flexible as possible a continuous adjustment of the radioscopy direction and the freest possible accessibility to a patient to be examined. A further object of the invention is to disclose an X-ray machine having such a patient-supporting device.

The invention attains this object by means of a device having the characteristics of the independent claim.

It is a fundamental concept of the invention to disclose a patient-supporting device, with a positioning device located under it, for an X-ray detector or an X-ray source; the positioning device has an arched arm, in which either the X-ray detector or the X-ray source is supported displaceably in the direction of the arch, and a base, in which the arched arm is supported displaceably in the

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direction of the arch. The use of an arched arm enables the flexible adjustability of the radioscopy direction in the same way as would be done with a C-arch. For the surgeon, this has the advantage that he can use continuously adjustable radii of motion and radioscopy angles in the way that is familiar and customary to him.

The movability of the X-ray detector or the X-ray source on the arched arm, however, simultaneously increases its range of motion in comparison with a C-arch, on which the X-ray detector and the X-ray source are secured nondisplaceably. As a result, to make a comparable range of motion possible, the arm can be reduced to half the length, compared to a C-arch arm. This reduces its bulk, and there is less hindrance to access to the patient-supporting device. Last but not least, the displaceability on a circular path, in cooperation with an X-ray source or X-ray detector located separately from the positioning device and displaceable on a contrarily extending circular path, makes it possible to create images of slices or three-dimensional images of the body to be examined. Such images of the body have been made until now under comparable conditions using C-arch X-ray machines, whose image data are processed into three-dimensional images by analogy with computed tomography image data. The prerequisite for this is the motion along a circular path whose center point is located in the body region to be examined.

In an advantageous feature of the invention, the arched arm is supported displaceably in the direction of the

arch in a second arched arm, and the second arched arm is supported in the base displaceably in the direction of the arch. By the use of a second displaceable arm, the range of motion of the X-ray detector can be doubled, without having to increase the length of each individual arched arm substantially. Thus a greater range of motion is attained while the bulk of the positioning device remains the same, and the accessibility to the patient-supporting device is not additionally hindered.

In a further advantageous feature of the invention, the X-ray detector or the X-ray source can be supported movably in the arched arm in the radial direction relative to the arch. As a result, the X-ray detector or the X-ray source can as needed be brought closer to a patient positioned in the center of the arch. This is especially advantageous if the positioning device is located under the patient-supporting table. If an X-ray detector is supported in the positioning device, it can be brought from below toward the patient- supporting table, so that an X-ray can be made with a vertical angle of incidence of the X-radiation. In this arrangement, X-ray images can be made of the kind that are possible with conventional X-ray machines with an X-ray detector under the table, known as Bucky systems. This expands the possibilities for using the X-ray machine.

In a further advantageous feature of the invention, the patient-supporting device is used in an X-ray machine, and the X-ray machine has an X-ray source that is movably

supported in all directions in space and is located separately from the positioning device. This configuration, because of the separate disposition of the X-ray source, makes especially free accessibility to the patient-supporting table possible, since the positioning device does not substantially restrict accessibility, and regardless of this the X-ray source can be positioned so as to present little hindrance as possible. At the same time, because of the free movability of the X-ray source, arbitrary angles of incidence can be set. The X-ray source can for instance be supported from a ceiling-mounted tripod, where essentially only from above can it restrict accessibility to the patient-supporting table.

In a further advantageous feature of the invention, the X-ray machine has a control unit, which is connected to the X-ray source and the positioning device and is embodied so as to move the X-ray source and the positioning device in a manner adapted to one another, so that they assume a predetermined orientation to one another. The orientation to one another can be selected such that the X-ray detector is at all times located in the X-ray beam of the X-ray source and perpendicular to it. This orientation makes it possible to create an X-ray image at all times, without a machine operator having to manually adjust the various individual positions exactly. Instead, it suffices if the X-ray source is aimed by a machine operator in a desired way, for instance, while the X-ray detector is made to automatically follow its motion by means of the control unit. Maintaining